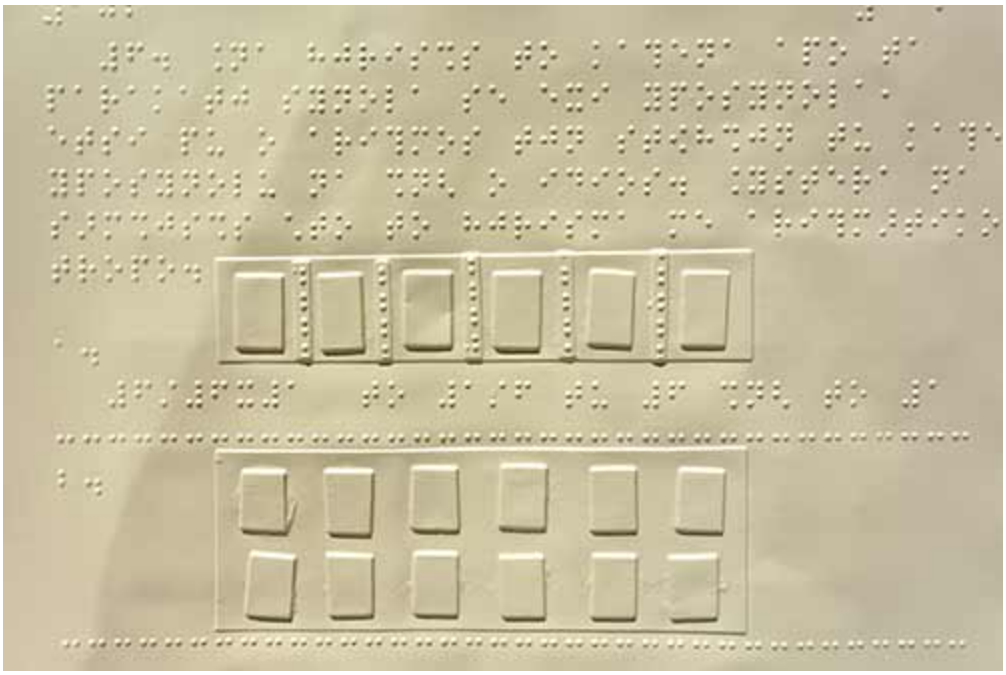
Accommodations Toolkit

Tactile Graphics: Research

This fact sheet on **tactile graphics** is part of the *Accommodations Toolkit* published by the National Center on Educational Outcomes (NCEO). It summarizes information and research findings on the use of tactile graphics as an accessibility feature or accommodation.[1] The toolkit also contains summary of states' accessibility policies for tactile graphics (/nceo/accommodations-toolkit/tactile-graphics/states-accessibility-policies).



What are tactile graphics? Tactile graphics communicate visual images, graphic ideas, or information in a format that is perceived by touch. These graphics do not necessarily replicate the printed version of an image in tactile form (Rosenblum & Herzberg, 2015). Tactile graphics are created in a variety of ways. Some techniques are printing on capsule or swell paper, embossing, making thermoform copies of graphics or objects, creating collage displays, or using electronic devices such as a tablet with speech and tactile capabilities (Landau et al., 2003; Rosenblum & Herzberg, 2015). As technology improves, the use of haptics (e.g., vibrations such as provided on cell phones) for students with visual impairments is being conducted with technology-based tactile graphics devices (Hansen et al., 2016; Landau et al. 2003).

What are the research findings on who should use this accommodation? Students who benefited most from tactile graphics when taking assessments used them routinely during classwork and homework, had exposure starting at an early age, and were most likely braille readers (Guzman-Orth et al., 2014; Hansen et al., 2016; Rosenblum & Herzberg, 2015; Zebehazy & Wilton, 2014).

What are the research findings on implementation of tactile graphics? Ten studies were located that addressed tactile graphics. Seven of these examined issues related to using tactile graphics accommodations.

- Four studies examined the appropriateness of tactile graphics. These studies found that inappropriate adaptations from print to tactile graphics is sometimes problematic and potentially very confusing to students (Hansen et al., 2016; Rosenblum & Herzberg, 2015; Schoch, 2010; Zebehazy & Wilton, 2014).
- One study compared 2-D and 3-D graphics. This case study found that students with visual impairments might glean more information from stories when provided with 3-D illustrations (Bara, 2018).
- One study (Landau et al., 2003) conducted a comparison of a tablet with speech and tactile capabilities to paper-based tactile graphics. When using the tablet, students completed the test more quickly and reported a greater sense of independence. The device also created a more standardized delivery.
- Ferrell and colleagues (2017) conducted a comparison of tactile graphics and audio descriptions for non-print reading students. For mathematics and English language arts assessments, students did the best with audio descriptions alone; for the science assessments, there was no difference in performance between the two conditions. In all three content areas, the lowest scores were produced when both accommodations (tactile graphics and audio descriptions) were provided. These researchers recommended that states adopt audible image description as an accommodation for state assessments because it can be helpful for students who read braille.
- Rosenblum and Herzberg (2015) recommended integrating student feedback into the development process for tactile graphics made for them. For best results, teachers should provide direct instruction on how to measure objects and locate specific information within a graphic due to the variety of ways that tactile graphics are created. For example, data displays such as circle graphs (Schoch, 2010) may be more difficult for students to interpret and student feedback on how to revise them may result in improved understanding.

What perceptions do students and teachers have about tactile graphics? Two research studies examined student and teacher perceptions about the use of tactile graphics.

- In one study, almost 60% of teachers of students with visual impairments were confident teaching students to use tactile graphic devices or assistive technology, though most did not consider themselves experts. Also, a small positive correlation was found between the number of years a teacher instructed students with visual impairments and the teacher's expertise levels with AT in general (Zhou et al., 2011).
- In another study, teachers of students with visual impairments generally had more positive attitudes toward low-tech tactile graphics options, and more negative perspectives about newer and higher-tech devices (DePountis et al., 2015).

What have we learned overall? In general, teachers feel that they need more training on how to use tactile graphics, especially for newer tactile graphic technology options. Students who use tactile graphics need to be literate in how to read them. Involving students in the development and refinement process of graphics can improve their understanding of the content. The tactile graphic must be of high quality in order to be legible by the student. However, adding an audio description to a provided tactile graphic may negatively impact student performance.

Footnotes

[1]

Research on tactile graphics summarized here is also available in NCEO's searchable Accommodations for Students with Disabilities Bibliography (https://nceo.info/Resources/bibliographies) and in NCEO syntheses of research from 1999 through 2018 (see summaries for: 1999-2001 (https://nceo.umn.edu/docs/OnlinePubs/TechReport34.pdf), 2002-2004 (https://nceo.umn.edu/docs/OnlinePubs/Tech45/Technical45.pdf), 2005-2006 (https://nceo.umn.edu/docs/OnlinePubs/Tech47/TechReport47.pdf), 2007-2008 (https://nceo.umn.edu/docs/OnlinePubs/Tech56/TechnicalReport56.pdf), 2009-2010 (https://nceo.umn.edu/docs/OnlinePubs/Tech65/TechnicalReport65.pdf), 2011-2012 (https://nceo.umn.edu/docs/OnlinePubs/Synthesis94/Synthesis94.pdf), 2013-2014 (https://nceo.umn.edu/docs/OnlinePubs/Report402/NCEOReport402.pdf), 2015-2016 (https://nceo.umn.edu/docs/OnlinePubs/NCEOReport412.pdf), 2017 (https://nceo.umn.edu/docs/OnlinePubs/NCEOReport418.pdf), 2018 (https://nceo.umn.edu/docs/OnlinePubs/NCEOReport423.pdf), 2019 (https://nceo.umn.edu/docs/OnlinePubs/NCEOReport433.pdf). See the reports and online bibliography for additional information about the criteria used to identify studies included in this fact sheet.

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